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ABSTRACT

The results of the radiological survey for Region I (Building 724 Area) of the SRE are described. All survey results are below the applicable limits, indicating that this area may be released to unrestricted use.

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I. INTRODUCTION

This report covers SRE Region I, located east of the main reactor complex (see Figure 1). The area is made up mainly of large sandstone formations covered with wild plant growth. Several facilities were located in the region and are identified as T723/T724. An asphalt road leads to this location. T723 is a 20-ft x 20-ft concrete pad used for sand blasting items and equipment that were known to be free of radioactivity.

Building T724 was the Hot Oil Sodium Cleaning facility. It was designed to be used for cleaning large pipes and assemblies from the secondary loop of the reactor. There was, however, a buildup of contamination from mixed fission products (MFP) over the lifetime of the facility. Readings of a few mR/hr could be detected in several places along the floor. Most of this activity was located inside a small trench along the west wall. The metal diamond-plate floor was cut free in an attempt to remove this contamination. Contamination could be detected in the underlying concrete at that time.

It was planned that the upper portion of the building would be used in support of another program. To achieve this, the walls and ceilings were decontaminated and when certified clean, were cut free from the bottom metal floor. Final survey results of the building, now located in Region IV and identified as T133, will also be reported in the document for that region. All that remained after the building had been removed was some contaminated metal flooring and concrete.

A jack-hammer was brought in to break the metal free and remove the concrete in large sections. It was felt that removing large pieces would help in contamination control. After the operation began, a network of rebar, not identified on the prints, prevented use of this

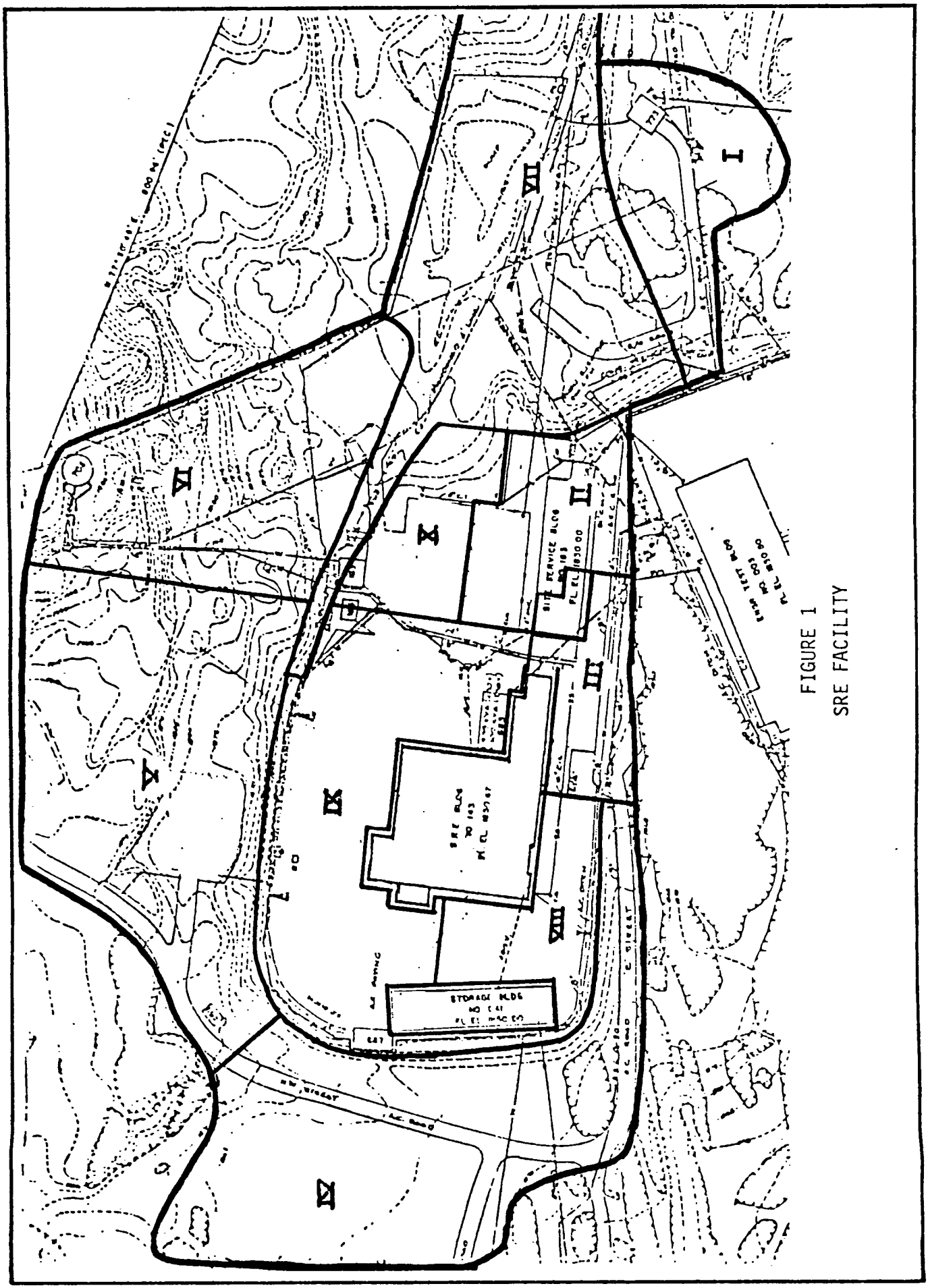

FIGURE 1
SRE FACILITY

method for removing the concrete. It became apparent at this time that the concrete would have to be removed by chipping away the upper layer. Only the concrete identified with yellow paint as contaminated was broken free and placed in 34-cubic foot waste containers. The remaining rubble was monitored with a thin window pancake G-M detector. Each location that had been contaminated was tested for residual activity by collecting loose powder and dust from the concrete.

II. SURVEYS AND RESULTS

A. REMOVABLE CONTAMINATION

The principal areas of concern were the two large concrete surfaces in the area. Both pads had been exposed to the weather. Routine surveys over the past few years had indicated pipes and heating equipment for the Hot Oil Sodium Cleaning facility were free of detectable activity. Twenty-five Whatman 2.5 cm filter papers were swiped around locations most likely to be contaminated on T724 before final D&D effort began. Each location for this test was outside the floor area that was known to be contaminated. Since a large area was to be covered, each location was divided into squares approximately 1 meter on a side. Within each square, random locations were swiped until approximately 100 cm^2 had been covered.

A smear survey of T724 showed six areas on the walls, out of 106 smears, with removable contamination greater than 100 dpm/100cm^2 beta. The walls were decontaminated to bring these areas below 50 dpm/100 cm^2 beta. A final survey, of 180 smears, showed all inside and outside surfaces of the building, including the ductwork, to be less than 50 dpm/100 cm^2 beta.

The building was then cut away from its foundation and moved to a temporary location near the Box Shop (T163) to permit measurement of surface radiation levels.

After all of the contaminated concrete had been removed, 45 smear swipes were taken in the area to justify final release. The highest level recorded at this time was 48 dpm/100 cm^2 at one location on the remaining concrete pad. All activity detected is assumed to be MFP older than 10 years.

All smears for this report were counted on an automatic counting system equipped with a thin window gas proportional detector. This system has a counting efficiency of about 36% for Bi-210 activity. A normal background count is approximately 20 counts per minute. Since the system is used in the beta-gamma mode above the alpha plateau, any alpha emitters present would also be detected. The normal efficiency for alpha activity is between 20 and 25%.

This area was not subject to contamination by alpha-emitting radionuclides. Therefore, the applicable limit for removable contamination is 100 dpm/100 cm^2 for beta-gamma emitters. All smears were below this limit.

B. SURFACE RADIATION

Two instruments were used for this portion of the survey; a Technical Associates Model CP-7 ion chamber detector and a PUG-1/P-11A probe (a thin window pancake G-M detector). This latter instrument was needed for its faster response and audible output to locate any contaminated areas. The CP-7 is an ion chamber measuring absorbed dose and has both the range and the absorber thickness required by the specifications for this test.

These instruments were used for a complete walk-through examination of all accessible parts of this region. Particular attention was paid to natural water courses and depressions where activity could be concentrated by runoff from surrounding areas. No area could be located within this region that exceeded twice the random background counts of about 100 cpm indicated on the PUG-1 GM detector. The probe on this instrument was held about 2-1/2 ft above the ground for this test. To provide complete coverage for this area, the main drainage channel was surveyed for about 1/8 to 1/4 mile beyond the site boundary.

The maximum dose rate indicated by the CP-7 was 0.04 mrad/hr. Natural background is approximately 0.04 mrad/hr, ± 0.05 mrad/hr for an uncertainty of ± 10% of full scale (0.5 mrad/hr) on this range.

An instrument survey of T724 after it was removed from Region I showed some areas above 0.1 mrad/hr. These areas were cut away. All subsequent readings with the CP-7 were less than 0.1 mrad/hr.

C. SOIL SAMPLES

The technique used to determine soil contamination consisted of removing samples from undisturbed top soil. Numbered salve-cans were used for this purpose. A grid network of wooden stakes was spread throughout the region. Each sample spot was modified from the basic plan to account for slope and terrain of the local landscape. Using the can lid as a scoop, soil from various spots located around each sample station was added to the can until it was nearly full. The contents were then mixed thoroughly by shaking. After all samples were collected, each sample can was opened and placed on a hot plate to drive off any moisture present. When dry, a small portion was taken from the can to be sieved through a Coor's sieve (Gooch crucible). From this, a one-gram portion was transferred onto an aluminum planchette. Alcohol was added and the sample tapped to settle it across the flat surface of the planchette. The sample was then heated to dryness. No chemical binders were added to hold the sample together for counting.

A thin window gas proportional detector operating in the preset count mode was used to count each sample.

A one-gram prepared KCl standard source (831 dpm) was counted with each group of soil samples. Using the mass-specific activity to calculate detector efficiency accounts for errors associated with self-

absorption, backscatter, and the difference between a 2π counter and a 4π source. Thus, based upon the statistical counting error of a single observation, the minimum detection level is approximately 9 pCi at the 95% confidence level.

The total of 27 soil samples showed a range of 16 pCi/gm to 45 pCi/g. The activity of natural uncontaminated soil ranges from about 20 pCi/g to 30 pCi/g.

D. CONCRETE SAMPLES

Five concrete samples representing each identified location within T724 were taken. Loose powder and dust were used for this purpose. All samples were placed on a hot plate to drive off water used in dust control. One-gram samples were prepared by passing material through a Coor's sieve (Gooch crucible), weighing the samples and wetting with alcohol. All samples were counted with a thin window, gas propotional counter having a background of approximately 20 cpm. A one-gram KCl standard was used to determine counter efficiency. Results indicated that four of the five samples were less than 100 pCi/g. The fifth sample read 140 pCi/g before a second layer of concrete was removed at that location (West Trench). All loose material of the second layer was removed and the trench was swept clean. No source of activity could be detected within the trench. The results from this survey indicate that no remaining activity was distributed in the concrete rubble. There was no evidence that the perimeter concrete outside this building had ever been contaminated.

E. WATER SAMPLES

There is only one location within this region where water could be trapped or retained. That is a concrete pit approximately 3-ft deep

outside of Building T724. After all of the contaminated concrete had been removed, two water samples were taken in this location. The second sample was taken immediately after heavy rainfall had covered this area with some runoff into the pit. From each sample, a measured 500 ml portion was reduced in volume to about 10 ml on a hot plate. Using a rubber policeman, undissolved solids and remaining liquid were transferred to a counting planchette and heated to dryness. A thin window gas proportional detector having a background of about 20 cpm was used to count the samples.

The limit for water is 3×10^{-7} μCi/cm^3 (Sr-90). The water sampled from this source had an activity of 2.3×10^{-8} μCi/cm^3, which is below the limit.

III. CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the Decontamination and Disposition of Facilities Program for release to unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release to unrestricted use.